

District Energy/CHP

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President



2003 Energy Why District Energy & CHP?

- District energy aggregates thermal loads to improve power/thermal ratios
- Load density and scale enhances capital and operating efficiencies (>70%), fuel flexibility
- Institutions own & operate central plants and facilities - customers receive comfort, convenience & savings
- Obstacles: Initial capital investment; NIMBY; power market risks; rules & regs



2003 Energy District Energy Industry Growing

Since 1990,

- 274,584,252 sf of new customers connected
- Avg over 20 million sf/yr
- 40 new downtown district cooling systems built – \$2 billion invested
- Customers conserve space & capital; avoid O&M; ease of use
- High reliability (99.999)
- Fuel flexibility & rate stability



2003 Energy Campus CHP

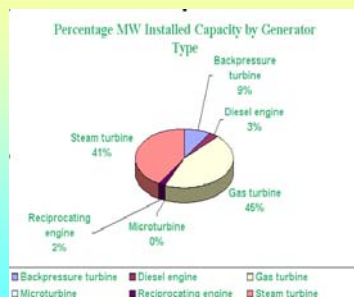
- Total Sector Capacity - 947.75 MW
- System Size (mean) - 16.34 MW (median) - 7.45 MW
- Efficiency over 72%; \$1058/KW
- Princeton Univ - 14.6 MW CCGT
 - cut energy costs \$3 million
 - increased reliability to 99.999 %
- UNC Chapel Hill - 28 MW CFB, HRSG
 - Cut NOx - 308 tons; SO₂ - 650 tons and CO₂ by 10,620 tons annually
 - Sold \$1.5 M power to local utility on time of day rate program
- UCLA - 43 MW CCGT Landfill gas
 - Produce 250 GWh - 85% of demand
 - 4 million cu ft landfill gas per day
 - Reduced overall emissions by 34%
 - Eliminated 20,000 lbs of CFCs



2003 Energy Campus CHP Fuels/Technologies

Fuel Mix:

- Natural Gas - 63%
- Coal - 17%
- Oil/Gas - 14%
- Coal/Gas - 4%
- Biomass - 1 %
- Landfill/Gas - 1%



2003 Energy Downtown Systems

- Con Edison Steam, New York City
 - 1850 customers - 700,000 tons steam a.c.
 - Avoid 550 MW peak power demand
 - 660 MW CCGT Re-powering project
- Trigen Philadelphia
 - 170 MW Grays Ferry CCGT cut emissions 74% while fuel use doubled < \$1000/KW
 - Produced 1.2 million MWh and 2.7 million MLB's steam - > 72% efficiency
- District Energy St. Paul
 - 26 MW CHP system burning 275,000 tons urban wood waste/yr
 - 21,000 ton cooling system growing (+6,000 tons by 2004)
 - Cited by President Bush as "model of efficiency, reliability, affordability" in National Energy Plan launch

